

PRIMARY EPIDEMIOLOGIC STUDIES ON SPOUSAL SMOKING AND LUNG CANCER

Introduction

Currently, 34 epidemiologic studies examining lung cancer incidence and spousal smoking have been published or are available as dissertations or conference presentations.¹⁻³⁴ The material in Section A of this notebook is discussed according to geographical area: United States (Tables 1 and 2), Asia (Tables 3 and 4) and Europe (Tables 5 and 6). For purposes of comparison, the relative risks (point estimates) given in the tables are the overall point estimates for spousal smoking reported in the papers. In some cases, the risk in the table was selected from numerous point estimates presented in the paper, based on different definitions of exposure, break-down of the sample by histological type, etc. Tables 7 and 8 summarize the workplace and childhood exposure data currently available.

Brief synopses and copies of the papers associated with these studies follow this introduction, at Tabs 1 to 34. For several of the more recent papers, copies of letters to the editor concerning the study may be found following the primary paper. The extensive criticisms of the Hirayama and Trichopoulos, et al., papers, however, are discussed in Section C of this notebook. The copies are highlighted in yellow for useful information and in blue for negative statements.

2023512525

United States Studies

Fourteen of the available studies on spousal smoking and lung cancer in nonsmokers (two cohort, twelve case-control) were conducted in the United States (Table 1).^{3,5,7-9,11,14,16,24,25,30-}

³³ None of the overall relative risks (RR) for spousal smoking reported in these fourteen studies is statistically significant.

The United States Environmental Protection Agency's 1993 Risk Assessment on ETS relied heavily upon eleven of the U.S. studies in reaching its conclusion.^{3,5,7-9,11,14,16,24,30,33} Although none of the studies originally reported a statistically significant overall risk estimate for spousal smoking, EPA used these studies to arrive at its conclusion that ETS exposure was associated with a statistically significant risk of lung cancer in the United States. In its analyses, EPA recalculated 90% confidence intervals for the risk estimates, instead of adopting the more commonly used 95% confidence interval. At 90%, one study, by Fontham, et al., had an overall risk estimate that was statistically significant. Nevertheless, ten of the eleven studies cited by EPA were compatible with the null hypothesis of no association between spousal smoking and lung cancer risk.

Among the more recently published papers, the paper by Janerich, et al., is based upon an unpublished dissertation by

in the Stockwell, et al., study, including the overall risk estimate for spousal smoking, were not statistically significant.

The third recent study, by Brownson, et al., is a very large case-control study, conducted in Missouri.³³ The authors of this study report no statistically significant risk estimates for any "quantitative" estimates of ETS exposure. Unlike the Fontham, et al., and Stockwell, et al., data, Brownson, et al., reported no statistically significant risk estimates when their data were analyzed by cell type.

2023512528

TABLE 1 -- UNITED STATES STUDIES OF SPOUSAL SMOKING
AND LUNG CANCER IN NONSMOKING WOMEN

STUDY	NO. OF CASES ¹	OR ²	95% CI
Brownson, et al., 1987	10	1.68	(0.39-2.97)
Brownson, et al., 1992	218	1.0	(0.8-1.2)
Buffler, et al., 1984	33	0.78	(0.34-1.81)
Butler, 1988	4	2.04	(0.54-7.65)
Correa, et al., 1983	14	2.07	(NS) ³
Fontham, et al., 1991	264	1.21	(0.96-1.54)
Garfinkel, 1981	88	1.27	(0.85-1.89)
Garfinkel, et al., 1985	134	1.22	(0.97-1.71)
Humble, et al., 1987 ⁴	16	1.8	(0.6-5.4) ⁵
Janerich, et al., 1990 ⁴	129	0.93	(0.55-1.57)
Kabat, 1990	35	0.90	(0.46-1.76)
Kabat & Wynder, 1984	13	--	(NS) ³
Stockwell, et al., 1992	210 ⁶	1.6	(0.8-3.0)
Wu, et al., 1985	29	1.2	(0.5-3.3)

1. Number of nonsmoking lung cancer cases married to smokers, and used in spousal smoking analysis.
2. Odds ratio for overall index of spousal smoking, as reported in original publication.
3. OR and/or CI not given; reportedly not statistically significant (NS).
4. Data are for males and females combined.
5. 90% CI, as reported in original publication.
6. Total number of cases; numbers not given for individual analyses.

2023512529

TABLE 2 -- CONTINUED

Janerich, et al., 1990	New York; large case-control study, based on data from 1987 Varela dissertation (itself unpublished); many risk estimates, only that for high exposure during childhood statistically significant
Kabat, 1990	Report of on-going American Health Foundation study, presented at scientific meeting; no statistically significant risk estimates reported; study appears to be well-designed
Kabat and Wynder, 1984	No significant differences between cases and controls regarding ETS exposure at home; concludes with detailed discussion of epidemiology of ETS
Stockwell, et al., 1992	Florida; small case-control study; results contrast with those of Fontham, et al.; all risk estimates were not provided in publication
Wu, et al., 1985	California; adenocarcinoma only (too few small cell cases to analyze)

2023512531

TABLE 2 -- COMMENTS ON UNITED STATES STUDIES OF SPOUSAL SMOKING
AND LUNG CANCER IN NONSMOKING WOMEN

STUDY	COMMENT
Brownson, et al., 1987	Colorado; adenocarcinoma only
Brownson, et al., 1992	Missouri; large case-control study; partial NCI funding; not included in EPA Risk Assessment
Buffler, et al., 1984	Texas; case-control study; no statistically significant risks reported for indices of ETS exposure
Butler, 1988	California; Ph.D. dissertation; never published; small sample size; deals with specific religious group, the Seventh-Day Adventists
Correa, et al., 1983	Louisiana; large case-control study, but extremely small sample size for ETS analyses
Fontham, et al., 1992	Five cities; report of on-going study; large sample size; commendable design when completed; high proportion of adenocarcinoma
Garfinkel, 1981	Part of American Cancer Society prospective study; large cohort study, but few deaths among nonsmoking women; data contrast with Hirayama's data from Japan
Garfinkel, et al., 1985	New Jersey and Ohio; numerous risk estimates presented; strong indication of respondent bias between spouse and children
Humble, et al., 1987	New Mexico; small sample size

2023512530

Asian Studies

Approximately 14 epidemiologic studies on spousal smoking and lung cancer in nonsmokers (one cohort, 13 case-control) have been conducted in China, Hong Kong, and Japan (hereafter, "Asian studies") (Table 2).^{1,4,10,12,15,17,18,20-22,27,28,29,34} Of this group, several studies report statistically significant overall risk estimates. However, none of the reported relative risks is greater than 2.5; relative risks under 3.0 have been described as "weak" (see Criticisms section in this notebook).

Of particular interest is the 1990 paper by Wu-Williams, et al., conducted in northeastern China.²⁸ This large case-control study reports a statistically significant negative risk associated with ETS exposure. Other factors (particularly indoor air quality) were reported to be associated with an elevated risk of lung cancer in the Wu-Williams, et al., study; such confounders were not always accounted for in the other Asian studies (see section on Confounders in this notebook).

2023512532

TABLE 4 -- CONTINUED

Shimizu, et al., 1988	Nagoya, Japan; reported statistically significant elevated risk estimates for smoking by case's mother or by case's husband's father
Sobue, et al., 1990	Osaka, Japan; statistically significant risk estimates for prior use of straw and/or wood as cooking fuel
Wu-Williams, et al., 1990	Shenyang and Harbin, China; U.S.-Chinese collaboration; overall point estimate statistically significantly negative; statistically significant risk estimates for a number of factors, including indigenous heating devices

2023512535

Luis Varela.²⁴ The Janerich, et al., paper discusses a subset of Varela's case-control study, and reports no statistically significant increased risk for spousal smoking, workplace exposure, or exposure in social settings. (It does, however, report a statistically significant increased risk for exposure during childhood (see below).) Overall, the Janerich/Varela study is important because of its large size and appropriate study design.

Three major new case-control studies, conducted in the United States, were published in 1991 and 1992.³¹⁻³³ Fontham, et al., presented a preliminary report on an ongoing multicenter case-control study.³¹ While the study design includes measures designed to minimize methodological concerns, the study is nevertheless incomplete: all data have neither been gathered nor fully analyzed. The Fontham, et al., study reports statistically significantly elevated risk estimates for adenocarcinoma, but not for the overall index of spousal smoking. A follow-up article claims that a number of confounders have been considered and dismissed by the authors.

A relatively small case-control study by Stockwell, et al., appeared in 1992.³² In contrast to Fontham, et al., this study reported generally lower risk estimates for adenocarcinoma than for other cell types, a striking example of the inconsistencies among the reported results of these studies. Many risk estimates

2023512527

TABLE 4 -- COMMENTS ON ASIAN STUDIES OF SPOUSAL SMOKING
AND LUNG CANCER IN NONSMOKING WOMEN

STUDY	COMMENT
Akiba, et al., 1986	Hiroshima and Nagasaki, Japan; study of atom bomb survivors
Chan & Fung, 1982	Hong Kong; small study
Du, et al., 1993	Guangzhou, China; small study; preliminary report
Gao, et al., 1987	Shanghai, China; looked at a number of potential confounders
Geng, et al., 1988	Tianjin, China; small study; limited information available
Hirayama, 1984	Japan (six prefectures); large cohort study, first published in 1981; heavily criticized for improper age standardization and other flaws
Inoue & Hirayama, 1988	Kamakura and Miura, Japan; small study; limited information available
Koo, et al., 1987	Hong Kong; many papers published on these data, some including interesting data on potential lifestyle and dietary confounders
Lam, et al., 1987	Hong Kong; problematic method of control selection
Lam, 1985	Hong Kong; unpublished dissertation, only some pages made available by University; adenocarcinoma only; see Lam & Cheng paper for some details
Liu, et al., 1991	Xuanwei, China; small study; presence of at least one smoker in household used as surrogate

2023512534

TABLE 5 -- EUROPEAN STUDIES OF SPOUSAL SMOKING
AND LUNG CANCER IN NONSMOKING WOMEN

STUDY	NO. OF CASES ¹	OR ²	95% CI
Hole, et al., 1989 ³	5	2.41	(0.45-12.83)
Kalandidi, et al., 1990	91	2.11	(1.09-4.08) (SS)
Lee, et al., 1986	22	1.0	(0.37-2.71)
Pershagen, et al., 1987	67	1.2	(0.7-2.1)
Svensson, et al., 1989	17	1.20	(0.4-2.9)
Trichopoulos, et al., 1983	38	2.4	-- (SS)

-
1. Number of nonsmoking lung cancer cases married to smokers, and used in spousal smoking analysis.
 2. Odds ratio for overall index of spousal smoking, as reported in original publication.
 3. Data are for males and females combined.

2023512537

TABLE 6 -- COMMENTS ON EUROPEAN STUDIES OF SPOUSAL SMOKING
AND LUNG CANCER IN NONSMOKING WOMEN

STUDY	COMMENT
Hole, et al., 1989	Scotland; cohort study; very few lung cancer deaths (4 cases and 4 controls in women); first published as Gillis, et al., 1984
Kalandidi, et al., 1990	Greece; Kalandidi has collaborated with Trichopoulos; despite Athens' severe air pollution, reported no risk related to surrogate for air pollution
Lee, et al., 1986	England; small subset of larger case-control study; no statistically significant risk estimates reported for numerous analyses of seven exposure indices
Pershagen, et al., 1987	Sweden; claimed to have controlled for radon, occupation, urbanization as possible confounders
Svensson, et al., 1989	Sweden; not spousal exposure--"exposure as adult at home <u>or</u> at work"
Trichopoulos, et al., 1983	Greece; small case-control study; heavily criticized; first published in 1981

2023512538

European Studies

Six studies on spousal smoking and nonsmoker lung cancer have been conducted in Europe (Table 3).^{2,7,13,19,23,26} A statistically significant overall risk estimate was reported in two studies, both by the same research group.^{2,26} No major cohort study has yet been conducted in Europe. The cohort studied by Gillis, et al., and Hole, et al., although large, included few lung cancer deaths.⁷

2023512536

Study	Point Estimate & 95% CI	Reference
6. <u>Kabat & Wynder, 1984</u>		
• current regular exposure		
F	26/53 cases v. 31/53 controls	from publication
	0.68 (0.32-1.47) (n.s.)	Lee, 1992; LeVois & Layard, 1992
M	18/25 cases v. 11/25 controls	from publication
	3.27 (1.01-10.6)	Lee, 1992
	3.27 (1.01-10.61)	LeVois & Layard, 1992
7. <u>Kabat, 1990</u>		
• ever exposed		
F	1.00 (0.49-2.06) (n.s.)	from publication; Lee, 1992; LeVois & Layard, 1992
M	0.98 (0.46-2.10) (n.s.)	from publication; Lee, 1992; LeVois & Layard, 1992
8. <u>Kalandidi, et al., 1990</u>		
• "between extreme quartiles"		
F	1.08 (0.24-4.87) (n.s.)	from publication
• some v. minimal exposure		
F	1.70 (0.69-4.18) (n.s.)	Lee, 1992
• exposed at work		
F	1.39 (0.76-2.54) (n.s.)	LeVois & Layard, 1992

2023512541

Exposure to ETS in the Workplace and Lung Cancer in Nonsmokers

The issue of ETS exposure in the workplace may be expected to receive increasing attention. The U.S. Occupational Safety and Health Administration (OSHA) initiated a regulatory process on indoor air quality in 1991 with a Request for Information. Subsequently, OSHA has referred to the U.S. Environmental Protection Agency's (EPA) 1993 risk assessment on ETS, which used data from epidemiologic studies which assessed ETS exposure in terms of spousal smoking, not smoking in the workplace.

The current epidemiologic data on workplace exposures to ETS and lung cancer in nonsmokers are reported in fourteen studies which examined workplace exposure via questionnaire.^{8,9,11,13,17,22,24-26,28,30-33} None of these studies provides adequate support for an increased risk of lung cancer associated with ETS exposure in the workplace. Only two studies report marginally statistically significant risk estimates. The point estimates of the studies (in alphabetical order) are presented in Table 7. (In the table, "n.s." stands for "not statistically significant.")

2023512539

TABLE 7 -- SPOUSAL SMOKING STUDIES INCLUDING ESTIMATES OF
WORKPLACE ETS EXPOSURE AND LUNG CANCER RISK IN NONSMOKERS

Study	Point Estimate & 95% CI	Reference
1. <u>Brownson, et al., 1992</u>		
• "highest quartile" of exposure		
F	1.2 (0.9-1.7) (n.s.)	from publication
2. <u>Butler, 1988</u>		
• worked with a smoker for 11+ years		
F	1.47 (0.15-14.06) (n.s.)	LeVois & Layard, 1992
M	0.0	
3. <u>Fontham, et al., 1991</u>		
• ever exposed		
F	1.34 (1.03-1.73)	from publication; LeVois & Layard, 1992
4. <u>Garfinkel, et al., 1985</u>		
• exposure in last 25 years		
F	0.88 (0.66-1.18) (n.s.)	from publication; Lee, 1992; LeVois & Layard, 1992
5. <u>Janerich, et al., 1990</u>		
• 150 person-years exposure		
M/F	0.91 (0.80-1.04) (n.s.)	from publication; Lee, 1992; LeVois & Layard, 1992

2023512540

<u>Study</u>	<u>Point Estimate & 95% CI</u>	<u>Reference</u>
14. <u>Wu-Williams, et al, 1990</u>		
• exposed at work		
F	1.1 (0.9-1.6) (n.s.)	from publication
	1.22 (0.95-1.57)	Lee, 1992
	1.1 (0.86-1.41)	LeVois & Layard, 1992

2023512543

TABLE 3 -- ASIAN STUDIES OF SPOUSAL SMOKING
AND LUNG CANCER IN NONSMOKING WOMEN

STUDY	NO. OF CASES ¹	OR ²	95% CI
Akiba, et al., 1986	73	1.5	(1.0-2.5) ³
Chan & Fung, 1982	34	--	(NS) ⁴
Du, et al., 1993	47	1.19	(0.66-2.16)
Gao, et al., 1987	189	0.9	(0.6-1.4)
Geng, et al., 1988	34	2.16	(1.03-4.53) (SS) ⁵
Hirayama, 1984	163	1.45	(1.04-2.02) ³ (SS)
Inoue & Hirayama, 1988	28	2.25	(0.91-7.10)
Koo, et al., 1987	51	1.64	(0.87-3.09)
Lam, et al., 1987	115	1.65	(1.16-2.35) (SS)
Lam, 1985	163 ⁶	--	-- (SS)
Liu, et al., 1991	45	0.74	(0.30-1.96)
Shimizu, et al., 1988	90	1.1	(NS)
Sobue, et al., 1990	64	0.94	(0.62-1.40)
Wu-Williams, et al., 1990	205	0.7	(0.6-0.9)

1. Number of nonsmoking lung cancer cases married to smokers, and used in spousal smoking analysis.
2. Odds ratio for overall index of spousal smoking, as reported in original publication.
3. 90% CI, as reported in original publication.
4. OR and/or CI not given. NS= Reportedly not statistically significant.
5. SS = Statistically significant.
6. Total number of cases; numbers not given for individual analyses.

2023512533

Study	Point Estimate & 95% CI	Reference
9. <u>Koo, et al., 1984</u>		
• exposed at workplace		
F	0.91 (not given) (n.s.)	from publication; (1987 paper more commonly used)
10. <u>Lee, et al., 1986</u>		
• ever exposed		
F	0.63 (0.17-2.33) (n.s.)	Lee, 1992; LeVois & Layard, 1992
M	1.61 (0.39-6.60) (n.s.)	Lee, 1992; LeVois & Layard, 1992
11. <u>Shimizu, et al., 1988</u>		
• someone at workplace smokes		
F	1.2 (not given) (n.s.)	from publication
	1.2 (0.70-2.04)	Lee, 1992
	1.2 (0.69-2.01)	LeVois & Layard, 1992
12. <u>Stockwell, et al., 1992</u>		
• exposure at work		
F	"no statistically significant increase in risk"	from publication
13. <u>Wu, et al., 1985</u>		
• exposed at work		
F	1.3 (0.5-3.3) (n.s.)	from publication; Lee, 1992; LeVois & Layard, 1992

2023512542

Childhood Exposure to ETS and Adult Lung Cancer in Nonsmokers

When the Janerich, et al., paper was published in 1990, the media focused on a single statistically significant risk estimate reported by the authors, i.e., an estimated OR of 2.07 (95% CI 1.16-3.68) for "household exposure to 25 or more smoker-years during childhood and adolescence."²⁴ This OR is the only statistically significant estimate out of 13 exposure categories in the paper. A single statistically significant point estimate could have easily occurred by chance alone in a set of analyses this large.

Only a few other studies have included questions concerning exposure to ETS during childhood, i.e., parental smoking. 5, 9, 11, 12, 15, 17, 23, 25, 27, 30-32 Regarding the studies then available, Ernst Wynder and Geoffrey Kabat wrote in a 1990 publication:

No consistent association has been reported for lung cancer and exposure to ETS in childhood, which might be expected to exert a greater effect, especially when followed by exposure throughout adulthood. Of course, recall of ETS exposure in childhood is more difficult than recall of such exposure in adulthood.

In: Wynder, E.L., and Kabat, G.C., "Environmental Tobacco Smoke and Lung Cancer: A Critical Assessment." In: Indoor Air Quality H. Kasuga (ed.). Berlin, Heidelberg, Springer-Verlag, 5-15 1990.

2023512544

Table 8 presents the reported risk estimates from the studies (13 to-date) which discuss childhood ETS exposure and lung cancer in nonsmokers. The studies are arranged alphabetically in the table. A second section of the table summarizes data from studies on "parental smoking" where it is unclear if this refers to exposure during adulthood or during childhood.

Study	Point Estimate & 95% CI	Reference
4. <u>Fontham, et al., 1991</u>		
• childhood defined as first 18 years of life		
• smoking of father		
F	0.82 (0.64-1.07) 0.91 (0.67-1.24)	from publication "
• smoking by mother		
F	0.84 (0.56-1.26) 0.85 (0.53-1.38)	from publication "
• smoking by other household members		
F	0.96 (0.71-1.29) 0.83 (0.59-1.18)	from publication "
• "no association was found between risk of any type of lung cancer and childhood exposure"		
5. <u>Gao, et al., 1987</u>		
• "ever lived with a smoker"		
• "no significant increase in risk was observed for overall exposure to environmental tobacco smoke during childhood"		
F	1.1 (0.7-1.7)	from publication; Lee, 1992
6. <u>Garfinkel, et al., 1985</u>		
• "exposure to smoke in childhood"		
F	0.91 (0.74-1.12)	from publication; Lee, 1992

2023512547

Study	Point Estimate & 95% CI	Reference
• smoking by individual family members		
• mother smoked		
F	1.6 (0.6-4.3)	from publication
• father smoked		
F	1.2 (0.6-2.3)	from publication
• siblings/other household members smoked		
F	1.7 (0.8-3.9)	from publication
12. <u>Svensson, et al., 1989</u>		
• included questions about domestic exposure during childhood		
• father smoked, age 0-9 years		
F	0.9 (0.4-2.3)	from publication; Lee, 1992
• mother smoked, age 0-9 years		
F	3.3 (0.5-18.8)	from publication; Lee, 1992
13. <u>Wu, et al., 1985</u>		
• "For childhood passive smoking exposure, we asked about the smoking habits (i.e., amount and years of smoking) of father, mother, or other household members when they lived with the respondent during her childhood and teenage years."		
• smoking by parents (adenocarcinoma cases)		
F	0.6 (0.2-1.7)	from publication; Lee, 1992

2023512550

Environmental Tobacco Smoke and Lung Cancer Risk in Nonsmoking Women," Journal of the National Cancer Institute 85(9): 750-751, 1993.

33. Brownson, R.C., Alavanja, M.C.R., Hock, E.T., and Loy, T.S., "Passive Smoking and Lung Cancer in Nonsmoking Women," American Journal of Public Health 82(11): 1525-1530, 1992.
34. Du, Y.X., Cha, Q., Chen, Y.Z., and Wu, J.M., "Exposure to Environmental Tobacco Smoke and Female Lung Cancer in Guangzhou, China," Proceedings of Indoor Air '93 1: 511-516, 1993.

2023512557

<u>Study</u>	<u>Point Estimate & 95% CI</u>	<u>Reference</u>
10. <u>Sobue, et al., 1988</u>		
• exposure during early childhood		
• father smoked		
F	0.60 (0.40-0.91)	from publication
• mother smoked		
F	1.71 (0.95-3.10)	"
• other household members smoked		
F	1.13 (0.69-1.87)	"
• smoking by father		
F	0.76 (0.50-1.16)	Lee, 1992
• smoking by mother		
F	1.42 (0.80-2.51)	Lee, 1992
• smoking by other household members		
F	1.12 (0.72-1.73)	Lee, 1992
11. <u>Stockwell, et al., 1992</u>		
• smoke-years (not defined) during childhood and adolescence, by parents and siblings, for all lung cancer cell types		
• less than 18 smoke-years		
F	1.6 (0.7-3.6)	from publication
• 18 to 21 smoke-years		
F	1.1 (0.5-2.6)	from publication
• 22 or more smoke years		
F	2.4 (1.1-5.4)	from publication

2023512549

Study	Point Estimate & 95% CI	Reference
7. <u>Janerich, et al., 1990</u>		
• subjects less than 21 years of age		
• 1 to 24 smoker-years		
M/F	1.09 (0.68-1.73)	from publication
• 25 or more smoker-years		
M/F	2.07 (1.16-3.68)	from publication
• smoking by household members before age 21		
M/F	1.30 (0.85-2.00)	Lee, 1992 (cites Varela)
8. <u>Kabat, 1990</u>		
• will look at specific family members who smoked, years of exposure, average number of hours of exposure per day, and subjective rating of intensity		
• exposed in childhood		
F	1.68 (0.86-3.27)	from publication
M	0.73 (0.34-1.59)	from publication
9. <u>Koo, et al., 1987</u>		
• household exposure while children, by one or both parent		
F	1.21	from publication; crude OR
	2.07 (0.51-95.17)	from publication; adjusted OR
	0.55 (0.16-1.77)	Lee, 1992

2023512548

SPOUSAL SMOKING STUDIES CONTAINING DATA ON "PARENTAL SMOKING"
THAT MAY OR MAY NOT REFER TO CHILDHOOD EXPOSURES

Study	Point Estimate & 95% CI	Reference
<u>Geng, et al., 1988</u>		
• mother and/or father smoked		
• not statistically significant		
<u>Pershagen, et al., 1987</u>		
• "at least one smoking parent"		
F	1.0 (0.4-2.3)	from publication; Lee, 1992
<u>Shimizu, et al., 1988</u>		
• mother smoked		
F	4.0 (s.s.)	from publication
• father smoked		
F	1.1 (n.s.)	from publication
<u>Wu-Williams, et al., 1990</u>		
• "lifetime residential exposure to tobacco smoke from cohabitants"		
• mother smoked		
F	0.9 (n.s.)	from publication
	0.85 (0.65-1.12)	Lee, 1992
• father smoked		
F	1.1 (n.s.)	from publication
	1.09 (0.84-1.40)	Lee, 1992

2023512551

TABLE 8 -- SPOUSAL SMOKING STUDIES INCLUDING ESTIMATES OF
ETS EXPOSURE DURING CHILDHOOD AND LUNG CANCER RISK IN NONSMOKERS

Study	Point Estimate & 95% CI	Reference
1. <u>Akiba, et al., 1986</u>		
• "no overall increased risk associated with parental smoking"		from publication
• M/F	no association	Lee, 1992
2. <u>Brownson, et al., 1992</u>		
• childhood defined as 17 years and younger		
• parents ever smoked		
F	0.7 (0.5-0.9)	from publication
• all household members ever smoked		
F	0.8 (0.6-1.1)	from publication
• estimated "moderate" exposure		
F	1.7 (1.1-2.5)	from publication
• estimated "heavy" exposure		
F	2.4 (1.3-4.7)	from publication
• "little evidence of increased lung cancer risk"		
3. <u>Correa, et al., 1983</u>		
• "during most of your childhood"		
• "No significant increases in risk were found in non-smokers . . . but small numbers preclude adequate analysis."		from publication
• M/F	no association	Lee, 1992

2023512546

REFERENCES

1. Hirayama, T., "Non-Smoking Wives of Heavy Smokers Have a Higher Risk of Lung Cancer: A Study from Japan," British Medical Journal I, 282: 183-185, 1981.

See also: Hirayama, T., "Cancer Mortality in Nonsmoking Women with Smoking Husbands Based on a Large-Scale Cohort Study in Japan," Preventive Medicine 13: 680-690, 1984.

See also: Hirayama, T., "Lung Cancer in Japan: Effects of Nutrition and Passive Smoking," Lung Cancer: Causes and Prevention, eds. M. Mizell and P. Correa (New York: Verlag Chemie International, 1984): 175-195.

2. Trichopoulos, D., Kalandidi, A., Sparros, L. and MacMahon, B., "Lung Cancer and Passive Smoking," International Journal of Cancer 27(1): 1-4, 1981.

See also: Trichopoulos, D., Kalandidi, A. and Sparros, L., "Lung Cancer and Passive Smoking: Conclusions of Greek Study," The Lancet II: 677-678, 1983.

3. Garfinkel, L., "Time Trends in Lung Cancer Mortality Among Nonsmokers and a Note on Passive Smoking," Journal of the National Cancer Institute 66: 1061-1066, 1981.

4. Chan, W.C. and Fung, S.C., "Lung Cancer in Non-Smokers in Hong Kong," Cancer Campaign Vol. 6, Cancer Epidemiology, ed. E. Grundmann (Stuttgart: Gustav Fischer Verlag, 1982): 199-202.

5. Correa, P., Pickle, L.W., Fontham, E., Lin, Y. and Haenszel, W., "Passive Smoking and Lung Cancer," The Lancet II: 595-597, 1983.

6. Buffler, P.A., Pickle, L.W., Mason, T.J. and Contant, C., "The Causes of Lung Cancer in Texas," Lung Cancer: Causes and Prevention, eds. M. Mizell and P. Correa (New York: Verlag Chemie International, 1984): 83-99.

7. Gillis, C.R., Hole, D.J., Hawthorne, V.M. and Boyle, P., "The Effect of Environmental Tobacco Smoke in Two Urban Communities in the West of Scotland," ETS - Environmental Tobacco Smoke: Report from a Workshop on Effects and Exposure Levels, eds. R. Rylander, Y. Peterson and M.-C. Snella, European Journal of Respiratory Diseases, Supplement 133(65): 121-126, 1984.

See also: Hole, D.J., Gillis, C.R., Chopra, C. and Hawthorne, V.M., "Passive Smoking and Cardiorespiratory Health in a

See also: Koo, L.C., Ho, J.H.-C., and Saw, D., "Is Passive Smoking an Added Risk Factor for Lung Cancer in Chinese Women?" Journal of Experimental and Clinical Cancer Research 3(3): 277-283, 1984.

18. Lam, T.H., Kung, I.T.M., Wong, C.M., Lam, W.K., Kleevens, J.W.L., Saw, D., Hsu, C., Seneviratne, S., Lam, S.Y., Lo, K.K. and Chan, W.C., "Smoking, Passive Smoking and Histological Types in Lung Cancer in Hong Kong Chinese Women," British Journal of Cancer 56(5): 673-678, 1987.
19. Pershagen, G., Hrubec, Z. and Svensson, C., "Passive Smoking and Lung Cancer in Swedish Women," American Journal of Epidemiology 125(1): 17-24, 1987.
20. Geng, G.-Y., Liang, Z.H., Zhang, A.Y. and Wu, G.L., "On the Relationship Between Smoking and Female Lung Cancer," Smoking and Health 1987, eds. M. Aoki, S. Hisamichi and S. Tominaga (Amsterdam: Excerpta Medica, 1988): 483-486.
21. Inoue, R. and Hirayama, T., "Passive Smoking and Lung Cancer in Women" Smoking and Health 1987, eds. M. Aoki, S. Hisamichi and S. Tominaga (Amsterdam: Excerpta Medica, 1988): 283-285.
22. Shimizu, H., Morishita, M., Mizuno, K., Masuda, T., Ogura, Y., Santo, M., Nishimura, M., Kunishima, K., Karasawa, K., Nishiwaki, K., Yamamoto, M., Hisamichi, S. and Tominaga, S., "A Case-Control Study of Lung Cancer in Nonsmoking Women," Tohoku Journal of Experimental Medicine 154: 389-397, 1988.
23. Svensson, C., Pershagen, G. and Klominek, J., "Smoking and Passive Smoking in Relation to Lung Cancer in Women," Acta Oncologica 28(5): 623-629, 1989.
24. Janerich, D., Thompson, W.D., Varela, L.R., Greenwald, P., Chorost, S., Tucci, C., Zaman, M.B., Melamed, M.R., Kiely, M. and McKneally, M.F., "Lung Cancer and Exposure to Tobacco Smoke in the Household," The New England Journal of Medicine 323: 632-636, 1990.

See also: Varela, L., Assessment of the Association Between Passive Smoking and Lung Cancer, Ph.D. Dissertation, Yale University, 1987.

25. Kabat, G.C., "Epidemiologic Studies of the Relationship Between Passive Smoking and Lung Cancer," Toxicology Forum, 1990 Annual Winter Meeting (transcript): 187-199, 1990.

2023512554

43, 1991," Cancer Epidemiology, Biomarkers and Prevention 1: 331, 1992.

See also: Fontham, E.T.H., Correa, P., Wu-Williams, A., Reynolds, P., Greenberg, R.S., Buffler, P.A., Chen, V.W., Boyd, P., Alterman, T., Austin, D.F., Liff, J., and Greenberg, S.D., "Correspondence re: E.T.H. Fontham, et al., Lung Cancer in Nonsmoking Women: A Multicenter Case-Control Study. Cancer Epidemiol., Biomarkers & Prev., 1:35-43, 1991," Cancer Epidemiology, Biomarkers and Prevention 1: 332, 1992.

See also: Lee, P.N., "Correspondence re: E.T.H. Fontham, et al., Lung Cancer in Nonsmoking Women: A Multicenter Case-Control Study. Cancer Epidemiol., Biomarkers & Prev., 1:35-43, 1991," Cancer Epidemiology, Biomarkers and Prevention 1: 332-333, 1992.

See also: Fontham, E.T.H., Correa, P., Wu-Williams, A., Reynolds, P., Greenberg, R.S., Buffler, P.A., Chen, V.W., Boyd, P., Alterman, T., Austin, D.F., Liff, J., and Greenberg, S.D., "Correspondence re: E.T.H. Fontham, et al., Lung Cancer in Nonsmoking Women: A Multicenter Case-Control Study. Cancer Epidemiol., Biomarkers & Prev., 1:35-43, 1991," Cancer Epidemiology, Biomarkers and Prevention 1: 333-334, 1992.

32. Stockwell, H.G., Goldman, A.L., Lyman, G.H., Noss, C.I., Armstrong, A.W., Pinkham, P.A., Candelora, E.C., and Brusa, M.R., "Environmental Tobacco Smoke and Lung Cancer Risk in Nonsmoking Women," Journal of the National Cancer Institute 84(18): 1417-1422, 1992.

See also: Stockwell, H.G., Candelora, E.C., Armstrong, A.W., and Pinkham, P.A., "Environmental Tobacco Smoke and Lung Cancer in Never Smoking Women," American Journal of Epidemiology 134(7), 1991.

See also: Lee, P.N., "Correspondence Re: Environmental Tobacco Smoke and Lung Cancer Risk in Nonsmoking Women," Journal of the National Cancer Institute 85(9): 748, 1993.

See also: Layard, M.W., "Correspondence Re: Environmental Tobacco Smoke and Lung Cancer Risk in Nonsmoking Women," Journal of the National Cancer Institute 85(9): 748-749, 1993.

See also: Switzer, P., "Correspondence Re: Environmental Tobacco Smoke and Lung Cancer Risk in Nonsmoking Women," Journal of the National Cancer Institute 85(9): 749-750, 1993.

See also: Stockwell, H.G., Goldman, A.L., Noss, C.I., Candelora, E.C., and Armstrong, A.W., "Correspondence Re:

2023512556

26. Kalandidi, A., Katsouyanni, K., Voropoulou, N., Bastas, G., Saracci, R. and Trichopoulos, D., "Passive Smoking and Diet in the Etiology of Lung Cancer Among Non-Smokers," Cancer Causes and Control 1: 15-21, 1990.
27. Sobue, T., Suzuki, R., Nakayama, N., Inubuse, C., Matsuda, M., Doi, O., Mori, T., Furuse, K., Fukuoka, M., Yasumitsu, T., Kuwabara, O., Ichigaya, M., Kurata, M., Kuwabara, M., Nakahara, K., Endo, S. and Hattori, S., "Passive Smoking Among Nonsmoking Women and the Relationship Between Indoor Air Pollution and Lung Cancer Incidence -- Results of a Multicenter Case Controlled Study," Gan to Rinsho 36(3): 329-333, 1990 (translation).
- See also: Sobue, T., "Association of Indoor Air Pollution and Lifestyle with Lung Cancer in Osaka, Japan," International Journal of Epidemiology 19(3, Suppl. 1): S62-S66, 1990.
28. Wu-Williams, A.H., Dai, X.D., Blot, W., Xu, Z.Y., Sun, X.W., Xiao, H.P., Stone, B.J., Yu, S.F., Feng, Y.P., Ershow, A.G., Sun, J., Fraumeni, J.F. and Henderson, B.E., "Lung Cancer Among Women in North-East China," British Journal of Cancer 62: 982-987, 1990.
29. Liu, Z., He, X. and Chapman, R.S., "Smoking and Other Risk Factors for Lung Cancer in Xuanwei, China," International Journal of Epidemiology 20(1): 26-31, 1991.
30. Butler, T.L., The Relationship of Passive Smoking to Various Health Outcomes Among Seventh-Day Adventists in California, Ph.D. Thesis, University of California, 1988.
- See also: Butler, T.L., "Passive Smoking and Cancer Among Female Seventh-Day Adventists in California," Community Health Studies 13(3): 369, 1989.
31. Fontham, E.T.H., Correa, P., Wu-Williams, A., Reynolds, P., Greenberg, R.S., Buffler, P.A., Chen, V.W., Boyd, P., Alterman, T., Austin, D.F., Liff, J., and Greenberg, S.D., "Lung Cancer in Nonsmoking Women: A Multicenter Case-Control Study," Cancer Epidemiology, Biomarkers & Prevention 1: 35-43, 1991.
- See also: Fontham, E.T.H., Correa, P., Buffler, P.A., Greenberg, R., Reynolds, P., and Wu-Williams, A., "Environmental Tobacco Smoke and Lung Cancer," The Cancer Bulletin 45(1): 92-94, 1993.
- See also: Mantel, N., "Correspondence re: E.T.H. Fontham, et al., Lung Cancer in Nonsmoking Women: A Multicenter Case-Control Study. Cancer Epidemiol., Biomarkers & Prev., 1:35-

General Population in the West of Scotland," British Medical Journal 299: 423-427.

8. Kabat, G. and E. Wynder, "Lung Cancer in Nonsmokers," Cancer 53: 1214-1221, 1984.
9. Garfinkel, L., Auerbach, O. and Joubert, L., "Involuntary Smoking and Lung Cancer: A Case-Control Study," Journal of the National Cancer Institute 75(3): 463-469, 1985.
10. Lam, W.K., A Clinical and Epidemiological Study of Carcinoma of Lung in Hong Kong, M.D. thesis submitted to University of Hong Kong, 1985 (only some pages available).

See also: Lam, T.H., and Cheng, K.K., "Passive Smoking Is a Risk Factor for Lung Cancer in Never Smoking Women in Hong Kong." In: Smoking and Health 1987. M. Aoki, S. Hisamichi, and S. Tominaga (eds.). Amsterdam, Excerpta Medica, 279-281, 1988.
11. Wu, A., Henderson, B.E., Pike, M.C. and Yu, M.C., "Smoking and Other Risk Factors for Lung Cancer in Women," Journal of the National Cancer Institute 74(4): 747-751, 1985.
12. Akiba, S., Kato, H. and Blot, W.J., "Passive Smoking and Lung Cancer Among Japanese Women," Cancer Research 46: 4804-4807, 1986.
13. Lee, P., Chamberlain, J. and Alderson, M.R., "Relationship of Passive Smoking to Risk of Lung Cancer and Other Smoking-Associated Diseases," British Journal of Cancer 54: 97-105, 1986.
14. Brownson, R.C., Reif, J.S., Keefe, T.J., Ferguson, S.W. and Pritzl, J.A., "Risk Factors for Adenocarcinoma of the Lung," American Journal of Epidemiology 125(1): 25-34, 1987.
15. Gao, Y.-T., Blot, W.J., Zheng, W., Ershow, A.G., Hsu, C.W., Levin, L.I., Zhang, R. and Fraumeni, J.F., "Lung Cancer Among Chinese Women," International Journal of Cancer 40: 604-609, 1987.
16. Humble, C.G., Samet, J.M. and Pathak, D.R., "Marriage to a Smoker and Lung Cancer Risk," American Journal of Public Health 77(5): 598-602, 1987.
17. Koo, L., Ho, J.H.-C., Saw, D. and Ho, C.-Y., "Measurements of Passive Smoking and Estimates of Lung Cancer Risk Among Non-Smoking Chinese Females," International Journal of Cancer 39: 162-169, 1987.